

Challenge M244-5

February 2025

Neck abscess – *Fusobacterium necrophorum*

HISTORY

A simulated blood culture sample collected from a 20 year old in-patient with swollen neck was sent to category A laboratories.

Participants were expected to isolate and report *Fusobacterium necrophorum*.

CMPT QA/QC/STATISTICS

All simulated blood samples are produced at CMPT according to CMPT internal protocols. The sample contained a pure culture of *Fusobacterium necrophorum*.

The samples are assessed for homogeneity and stability using in-house quality control methods and random selection of samples before and during production, and post sample delivery. The number of random samples selected is 15% of the total production batch.

The challenge sample lot was confirmed to be homogeneous and stable for 3 days after shipping date. Organism identification was confirmed by a reference laboratory.

All challenge components have in-house assigned values based on the most clinically appropriate result; the most clinically appropriate result is determined by expert committee evaluation. No further statistical analysis is performed on the results beyond that described under "Suitability for grading."

SURVEY RESULTS

Reference laboratories: 6/13 labs reported *Fusobacterium necrophorum*, 1 lab reported *Fusobacterium necrophorum* and *Klebsiella pneumoniae*, 5 labs reported no growth and 1 lab indicated it does not normally process the sample - UNGRADED due to lack of consensus

Participants: 16/48 processing participants reported *Fusobacterium*. 23 did not obtain any growth. (Table 1)

MAIN EDUCATIONAL POINTS from M244-5

1. Microscopy may provide clues to the identification of this organism given it frequently presents as long "fusiform" bacilli; however, the pleomorphic nature of the genus requires that further testing is required for a definitive diagnosis.
2. While anerobic organisms are an uncommon cause of bacteraemia, the addition of anaerobic bottles is crucial for their recovery and should always be included in each set.
3. Organisms seen on Gram stain but fail to grow aerobically provide additional clues that the organism is an obligate anaerobe.
4. Antimicrobial susceptibility of *Fusobacterium* is not predictable, and susceptibility tests should always be set up on serious and monomicrobial infections.

Suitability for Grading

A challenge is considered suitable for grading if agreement is reached by 80 percent of selected reference group and at least 50 percent of the participants.

Organism identification did not achieved consensus due to low stability and viability of the sample therefore, the challenge was not suitable for grading.

Grading

This challenge was ungraded due to lack of viability of organism.

Table 1. Identification results

Reported	Total	Grade
<i>Fusobacterium necrophorum</i>	13	ungraded
<i>Fusobacterium necrophorum</i> , <i>Klebsiella pneumoniae</i>	1	ungraded
<i>Fusobacterium</i> sp., +/-refer	2	ungraded
anaerobic gram negative bacilli, refer	3	ungraded
Gram negative bacilli/rods, refer	3	ungraded
<i>Cutibacterium acnes</i>	1	ungraded
<i>Porphyromonas asaccharolytica</i>	1	ungraded
No growth	23	ungraded
No organism identified	1	ungraded
no report	1	ungraded
sample not normally processed	2	ungraded
Total	51	

COMMENTS ON RESULTS

Only 6 of 13 reference labs correctly identified the organism as *F. necrophorum*. An additional reference lab also identified the organism correctly but also reported *K. pneumoniae* and 5 failed to recover the organism.

Of the 51 labs that participated in this challenge, only 13 correctly identified the organism to species level. Three labs labeled the organism as anaerobic gram-negative bacilli and appropriately referred the isolate for further identification. More disconcerting is that 23 labs were unable to grow this isolate in culture.

ISOLATION AND IDENTIFICATION

Fusobacterium species are gram-negative obligate anaerobic bacilli that are present as part of the normal flora of the human mouth, vagina, and gastrointestinal tract.

Fusobacterium species usually produce good growth on anaerobic blood agar after 24 to 48 hours of incubation ¹.

Fusobacterium have variable colonial morphology, so microscopy and further identification is required ^{2,3}. *F. nucleatum* typically appears as slender gram-negative rods.

Most cells are 5 to 10 µm long and have sharp, pointed ends ³. Microscopic morphology of *F. mortiferum* reveals filaments containing swollen areas with large, round bodies and irregular staining. *F. necrophorum* has a similar morphology to *F. mortiferum* but usually fewer round bodies ².

There are several commercial identification kits available. Classical tests include the use of special-potency antibiotic disks – kanamycin (1000 ug), colistin (10 ug) and vancomycin (5 ug). *Fusobacterium* species are resistant to vancomycin, but sensitive to both colistin and kanamycin. *F. nucleatum* and *F. necrophorum*, are indole positive and nitrate negative ².

MALDI-TOF identification is promising but minor errors of identification occur. *F. nucleatum* identified as *F. naviforme* has been noted. MALDI-TOF identification may improve as databases expand.¹⁶

ANTIMICROBIAL SUSCEPTIBILITY

Antimicrobial susceptibility should be performed on isolates from normally sterile body sites, e.g. endocarditis, osteomyelitis, joint infections, and bacteremia. Due to local variability, it is recommended that the resistance patterns for anaerobes be monitored periodically at individual hospitals and antibiograms published.

For gram negative anaerobes, CLSI recommends a susceptibility panel including clindamycin, metronidazole, piperacillin-tazobactam, and meropenem with penicillin as a supplemental agent that is tested selectively. It would be appropriate to test penicillin for *Fusobacterium* species in this case because it was isolated in a pure culture, and penicillin may be considered for treatment.

CLINICAL RELEVANCE

F. nucleatum forms part of the normal oral, gastrointestinal, urogenital and upper respiratory tract flora.³ It is most commonly associated with periodontal disease and less frequently with obstetric infections, brain abscess complicated periodontal disease and bacteremia during prolonged neutropenia ⁵⁻⁸.

Fusobacterium species have been reported to be the third most common anaerobe isolated from blood following *Bacteroides* species and *Clostridium* species. Infections involving *Fusobacterium* species are frequently monomicrobial whereas infections associated with other anaerobes are frequently polymicrobial ⁹.

During a 14-year period study of wounds and abscesses, *Fusobacteria* were least commonly isolated among the five anaerobes after *Bacteroides* species, *Clostridium* species, *Peptostreptococcus* species and *Prevotella* species. Overall, most wounds and abscesses were polymicrobial ⁹.

Fusobacterium necrophorum is the most common cause of Lemierre's syndrome, which refers to a septic thrombophlebitis of the internal jugular. Lemierre's syndrome was first described by Andre Lemierre (1875-1956) in 1936 ¹⁰.

The disease usually affects young adults and incidence rates of one per million people a year have been reported. *F. nucleatum* is an occasional cause of the syndrome (3% of cases) ¹⁵. The diagnosis is suggested by fever, pain, and swelling along the angle of the jaw and sternocleidomastoid muscle ^{5,7,11,12}.

Lemierre's syndrome was rarely reported during the 1960s and 1970s, when penicillin was frequently used to treat pharyngeal infections. Subsequent re-emergence of this "forgotten disease" has resulted in its being much more commonly recognized ¹³. Once almost uniformly fatal, Lemierre's syndrome still carries a mortality rate as high as 20%.

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